ClimateWire

3. TECHNOLOGY: DOE scientists track buried CO2 with electrodes deep underground *(06/03/2010)*

Lauren Morello, E&E reporter

Scientists working on an Energy Department-sponsored carbon sequestration project near Natchez, Miss., say they have successfully used electrodes to monitor carbon dioxide pumped thousands of feet below Earth's surface.

The technique, known as electrical resistance tomography (ERT), is one of several approaches scientists working at the Cranfield oil field site are using as they search for ways to keep tabs on the movement of plumes of CO2 stored deep underground. That ability to monitor deep underground reservoirs is crucial to testing the viability of sequestering coal-fired power plants' greenhouse gas emissions.

"ERT gives you a very nice image of what's going on ... that you may not have with other methods," said Charles Carrigan, a geophysicist at Lawrence Livermore National Laboratory who led the effort to test the method at the Cranfield site.

The technique might one day be used to monitor a sequestration site for signs that CO2 stored there is escaping its reservoir, moving upward toward aquifers or the Earth's surface, he said.

Carrigan said the ERT technique is not new, but what is notable is the depth at which his team was able to deploy it successfully -- to 10,000 feet at the Mississippi site run by the Southeast Regional Carbon Sequestration Partnership, compared to the previous record of 2,400 feet set by a European sequestration project.

"The driver here was to see if we could do it. It had never been done at this depth before," he said. "This is largely a proof of concept. It's yielding interesting results, showing the movement of the [CO2] plume that appear to be consistent with" other methods the scientists have used to monitor the underground reservoir.

Pushing 'spaghetti' down a hole

To make it work, scientists had to confront several technical challenges -- among them, how to snake electrodes down 10,000 feet underground in monitoring wells at the sequestration site.

They ended up placing electrodes on the outer walls of the very bottom sections of long, thin steel and fiberglass tubes 7 to 13 inches wide and roughly 10,500 feet long -- one tube each for two monitoring wells.

"It was like pushing cooked spaghetti down a hole," Carrigan said, since the wells the scientists used weren't perfectly vertical.

Those wells were situated about 135 feet apart, with the well used to inject CO2 into a rock formation deep underground sitting between them.

By passing electrical currents back and forth between the two sets of electrodes -- connected by cables to recorders at the Earth's surface -- the scientists were able to measure the electrical resistance of what lay between them.

The carbon dioxide in the storage reservoir has five times more resistance to the currents than the briny water it displaced. By comparing readings collected before and after the CO2 was pumped underground, the scientists were able to track the plume's movement.

"The whole idea is to build a better picture as to what is happening with the carbon dioxide plume -- where it's going and how it's developing," Carrigan said.

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